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HABITAT USE OF SYMPATRICALLY NESTING FISH CROWS AND AMERICAN CROWS

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ABSTRACT.—We examined habitat use of sympatric Fish Crows (*Corvus ossifragus*) and American Crows (*C. brachyrhynchos*) nesting in the vicinity of waterbird breeding locations at the Rockaway Peninsula, New York City. Fish Crows nested significantly more often at natural habitats, including coastal dunes and salt marsh islands; American Crows nested significantly more often at residential and recreational areas. In regard to potential foraging areas, Fish Crows nested closer to waterbird colonies and to the water's edge while American Crows nested closer to a garbage source and to lawns. Fish Crows nested significantly more often in deciduous trees that were native, while American Crows nested significantly more often in evergreen trees that more frequently were exotic, especially Japanese black pine (*Pinus thunbergii*). Finally, we consider the potential predatory impact of sympatric crow species on waterbirds in light of their habitat use. *Received 4 February 2003, accepted 25 September 2003.*

Fish Crows (*Corvus ossifragus*) and American Crows (*C. brachyrhynchos*) are common corvids in North America, yet limited information is available about their basic biology and interactions in sympatry (McGowan 2001, Verbeek and Caffrey 2002). Fish Crows occur along the Atlantic and Gulf coasts as well as connecting rivers where they are sympatric with American Crows, which are distributed across North America. Both species build stick nests at the tops of trees and have an omnivorous diet that includes fruits, grains, insects, earthworms, human garbage, bird eggs, and chicks.

Fish Crow and American Crow populations are increasing across their ranges, including metropolitan areas where they appear to adapt to city conditions (Gorenzel and Salmon 1992, McGowan 2001, Verbeek and Caffrey 2002). This is a conservation concern for urban bird species already stressed by habitat loss and human disturbance, since crows are egg and chick predators. Avian taxa susceptible to crow predation include waterbirds, such as terns, skimmers, herons, and especially the endangered or threatened Piping Plover (*Charadrius melodus*; U.S. Fish and Wildlife Service 1985; Lauro and Tanacredi 2002).

Their geographic distributions suggest that Fish Crows are coastal specialists while American Crows are generalists across their range. Thus, we examined the hypothesis that within an area of sympatry at the Rockaway Peninsula, New York City, Fish Crows would select natural, coastal habitats where waterbirds concentrate while American Crows would utilize all available habitats including natural, coastal areas and sites of human habitation.

METHODS

Study area.—We conducted the study during 1998 along the Rockaway Peninsula at the western tip of Long Island, New York (40° 35′ N, 75° 53′ W), at Gateway National Recreation Area, a unit of the National Parks System, and in the surrounding residential community. Locations studied included Breezy Point to Riis Park, Floyd Bennett Field, and several salt marsh islands in Jamaica Bay. More natural environments occur within the park while humanized sites occur mainly at the Breezy Point Cooperative, a residential area, and at recreational and administrative sites within the park.

Breezy Point is at the tip of the Rockaway Peninsula, west of the Cooperative, and is approximately 16 km southeast of Manhattan, extending into New York Harbor. It contains barrier beach habitat uninhabited by humans, with shoreline dunes dominated by American beachgrass (*Ammophila breviligulata*). The

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center area contains woody shrubs, primarily bayberry (*Myrica pensylvanica*), with scattered small trees, including black cherry (*Prunus serotina*). The dune area is a nesting location for Piping Plovers, Herring Gulls (*Larus argentatus*), Great Black-backed Gulls (*L. marinus*), Roseate Terns (*Sterna dougallii*), Common Terns (*S. hirundo*), and Least Terns (*S. antillarum*; Gilmore et al. 1998).

We studied three uninhabited salt marsh islands that had trees suitable for crow nesting, Canarsie Pol, Ruffle Bar, and Little Egg. These islands have dredge spoil deposits at middle to late successional stages, dominated by black cherry, black locust (*Robinia pseudoacacia*) and eastern cottonwood (*Populus deltoides*). Each of the islands has a Herring Gull and Great Black-backed Gull nesting colony. Canarsie Pol has a mixed species heronry with Great Egrets (*Ardea alba*), Snowy Egrets (*Egretta thula*), Little Blue Herons (*E. caerulea*), and Glossy Ibises (*Plegadis falcinellus*).

Habitat use.—We examined all accessible locations in the study area for nesting crows weekly during 1998, beginning 15 March and continuing through the end of nesting in August. We collected habitat use data for first nests only. We examined habitat use at three different scales: general habitats, territories, and nest sites, as it is believed that birds select habitats in this order (Burger 1985, Klopfer and Ganzhorn 1985, Sherry and Holmes 1985).

We designated the general habitat type for each nest as either peninsula or salt marsh island. The category of peninsula included the areas from the tip of Breezy Point to Riis Park and Floyd Bennett Field. We compared the peninsula (1,022 ha) and salt marsh islands (151 ha) with respect to nesting density (pairs/ha) of the species present. All environments were included for calculations since crow territories occurred across all spaces.

To examine territory and nest site use, we measured physical and vegetative characteristics around the nest tree and of the nest tree itself. Where applicable, we measured the same physical and vegetative characteristics at a random site within a 100-m radius of each nest. We determined the location of the random point by selecting a direction (north, south, east, or west) and then a distance (between 1 and 100 m) using a random numbers table.

We measured territory characteristics, including distance from nests to potential feeding areas at the waters edge, a waterbird colony, a lawn, and a garbage container. To characterize nest location relative to human habitation, we measured distance to nearest building. Other territory attributes we measured included distance to the nearest tree, to the edge of a patch of woods, and to the nearest conspecific neighbor, as well as the number of trees, scrub height, and percentage of scrub within a 10-m circle of the nest.

To examine nest site use we identified nest tree species and determined whether it was native or exotic. We also measured nest tree height and nest height using a clinometer. We recorded the number of limbs upon which the nest was placed and the diameter of the tree (dbh). Finally, we estimated visibility from nest sites as the degrees of a circle visible to a bird sitting on a nest.

RESULTS

General habitat and territory use.—Fish Crows nested more frequently at natural coastal environments while American Crows nested more frequently at residential and recreational locations. We located 19 Fish Crow nests: 2 at Breezy Point, and 17 on salt marsh islands. We located 23 American Crow nests on the Peninsula at residential and recreation locations; no nests were located at Breezy Point or on salt marsh islands. Compared to American Crow nests, Fish Crow nests were significantly closer to water and to a waterbird colony, but significantly farther from buildings, garbage sources, and lawns (Table 1).

Fish Crow nesting density was higher on salt marsh islands (0.113 pairs/ha) than on the peninsula (0.002 pairs/ha), and was higher on salt marsh islands than American Crow densities on the peninsula (0.023 pairs/ha). Nearest conspecific neighbor distances for nesting Fish Crows were significantly less than those for American Crows (Table 1).

Nest site use.—Fish Crows nested more frequently in deciduous (94%) than in evergreen (6%) trees. However, the habitats where Fish Crows nested had mainly deciduous trees (100% of the randomly selected trees) and few evergreens, providing little opportunity for

TABLE 1. Characteristics of Fish Crow (n = 17) and American Crow (n = 23) nest sites and random sites. Fish Crows selected nest sites in more natural habitats, especially near waterbird colonies, while American Crows selected nest sites at residential and recreational locations. Data are from western Long Island, New York, 1998. Test statistics and probabilities are from Wilcoxon two-sample tests.

	Fish Crow					
	Nest site		Random site		Site comparisons	
	Mean	SE	Mean	SE	Z	P
Distance (m) of nest to						
Conspecific neighbor	139	23	—	—	—	—
Water	166	32	176	35	−0.19	0.8497
Waterbird colony	10	5	7	3	−0.14	0.8886
Building	1,479	110	1,495	103	0.04	0.9725
Garbage container	1,479	110	1,496	102	0.05	0.9725
Lawn	1,524	87	1,532	86	0.00	1.000
Patch edge	6	2	5	2	−0.42	0.6742
10-m circle around nest						
Number of trees	18	6	10	4	1.12	0.2619
% scrub	63	7	56	7	0.88	0.3785
Scrub height (cm)	72	18	50	11	0.22	0.8228
Nest tree						
Nearest tree (m)	14.4	5.5	24.0	8.6	−1.33	0.1846
DBH (cm)	81.8	31.4	31.3	7.1	1.66	0.0975
Tree height (m)	9.4	1.5	5.7	0.5	1.67	0.0946
Nest height (m)	7.1	1.1	—	—	—	—
Visibility (degrees)	195	29	—	—	—	—
Number of tree limbs supporting nest	3	0.3	—	—	—	—

choice. This habitat also provided a nearly even mix of native (48%) and exotic trees (52%), but Fish Crows nested significantly more frequently in native (82%) than in exotic (18%) trees (χ^2 = 4.64, df = 1, P = 0.031).

In contrast, American Crows nested more frequently in evergreen (65%) than in deciduous (35%) trees, which differed significantly from their availability at random sites (30% versus 70%, respectively; χ^2 = 5.58, df = 1, P = 0.018). American Crows also nested more frequently in exotic (74%) than in native (26%) trees, but this difference was similar to the availability of exotic and native trees at random sites (57% and 43%, respectively; χ^2 = 1.53, df = 1, $P > 0.23$). Fourteen of the fifteen evergreen nest trees were the exotic Japanese black pine (*Pinus thunbergii*); the one native evergreen nest tree was a Red Cedar (*Juniperus virginiana*).

A trend for both crow species was to select nest trees that were larger than those available (Table 1). Both species selected trees that were significantly taller than random trees, and the mean dbh values were greater than those of random trees, although they were not significantly different. The evergreen trees were taller than the deciduous trees in our study area, so American Crows nested in taller trees than did Fish Crows. Furthermore, American Crows selected nesting areas where tree density (measured by number of trees/10-m circle, and distance to nearest tree) was significantly greater than in surrounding random sites (Table 1). No significant differences were found for Fish Crows for similar comparisons, although mean values showed a similar trend to that of American Crows (Table 1).

Both species placed nests about 2 m from the tops of trees in a crotch that contained a mean of 3 limbs, with a mean visibility ≥195° (Table 1). The areas underneath deciduous trees where Fish Crows nested had more scrub compared to the areas underneath evergreens where American Crows nested as indicated by significant differences in species comparisons for nest and random locations (Table 1).

DISCUSSION

We found support for the hypothesis that Fish Crows are more closely associated with

TABLE 1. EXTENDED

American Crow						Species comparisons			
Nest site		Random site		Site comparisons		Nest sites		Random sites	
Mean	SE	Mean	SE	*Z*	*P*	*Z*	*P*	*Z*	*P*
625	63	—	—	—	—	−4.90	0.0001	—	—
361	54	317	45	0.49	0.6208	−2.77	0.0057	−2.22	0.0267
3,242	205	3,248	205	−0.08	0.9387	−5.39	0.0001	−5.26	0.0001
186	64	181	70	0.05	0.9562	5.12	0.0001	5.06	0.0001
111	62	85	26	−1.29	0.1985	5.15	0.0001	5.34	0.0001
75	22	85	26	0.62	0.5346	5.34	0.0001	5.37	0.0001
6	2	5	2	0.94	0.3469	0.44	0.6596	1.07	0.2868
10	2	6	1	1.80	0.0722	0.14	0.8910	−0.91	0.3629
34	8	29	7	0.45	0.6501	2.61	0.0091	2.54	0.0111
25	8	25	7	0.07	0.9471	2.41	0.0159	2.62	0.0089
2.3	0.5	3.6	0.5	−1.90	0.0574	0.81	0.4196	1.89	0.0591
65	9.6	55.4	7.9	0.46	0.6445	−0.90	0.3683	−2.27	0.0231
11.6	0.6	8.3	0.7	3.19	0.0014	−2.30	0.0214	−2.70	0.0070
9.9	0.7	—	—	—	—	−2.69	0.0076	—	—
251	22.0	—	—	—	—	−1.78	0.0744	—	—
2.9	0.2	—	—	—	—	−0.19	0.8480	—	—

coastal environments where waterbirds concentrate than are American Crows. Fish Crows nested more frequently in natural habitats within the National Park, including the dune area at Breezy Point and salt marsh islands in Jamaica Bay. However, results suggested that at this study site American Crows were not generalists across all habitats as they showed a greater association with areas of human habitation. American Crows nested most frequently at recreational areas within the National Park and at residential and commercial areas along the Rockaway Peninsula.

One possible explanation for the differences in general habitats between the two species at this area may be related to preferred prey within nesting territories. Fish Crows selected habitats that provided ready access to waterbird eggs and chicks, as evidenced by the significantly shorter distances to a waterbird colony; all Fish Crow nests were within a waterbird colony. At the Breezy Point tip, Fish Crows nested at the center of a gull colony where they systematically hunted their surrounding territory for food, including the shore edge where Piping Plovers nested. Moreover, an artificial nest study at this site revealed that crows were a more serious predator of waterbird eggs than other potential predators, including gulls (Lauro and Tanacredi 2002). Although crow species distinctions were not made in that study, it is likely that Fish Crows were the main crow predator since they were the only crow species to defend territories at the tip. On the islands of Canarsie Pol and Ruffle Bar (Piping Plovers did not nest here) we observed collections of predated heron and gull eggs under Fish Crow nests. Fish Crows are well known predators of waterbird eggs at coastal areas and other studies have documented that they create middens of predated eggs (Kalmbach 1939, Bent 1946, Burger and Hahn 1977, Shields and Parnell 1986, Massey and Fancher 1989, Post 1990, Lauro and Tanacredi 2002).

All American Crow territories were either completely within or on the edge of residential and recreational areas, and no nests were found at gull colonies or heron colonies during this study. Throughout the study area we

regularly observed American Crows foraging on garbage and on lawn invertebrates. American Crows also are well known predators of bird eggs and chicks, and we observed them foraging on beaches that bordered residential and park regions where waterbirds nested. During this study American Crows preyed upon Piping Plover eggs and chicks (Gilmore et al. 1998). Thus, this study and others suggest that although both species of crows are predators of waterbird eggs and chicks, Fish Crows may be specialists for this type of prey.

Another factor contributing to species differences in general habitat may be related to preferred nest tree type. American Crows selected evergreen trees while Fish Crows nested mainly in deciduous trees. Other studies suggest that American Crows prefer coniferous trees (Bent 1946, Chamberlain-Auger et al. 1990). Therefore, American Crows may have avoided natural habitats because they had fewer suitable trees for nesting. Evergreens provide year round protection from the elements, and cover from predators, compared to deciduous trees that have minimal protection prior to leafing out. This may be important to American Crows which maintain year round territories (Stouffer and Caccamise 1991, Caccamise et al. 1997) and perhaps facilitates earlier nesting.

Our results suggest that the practice of planting exotic evergreens, such as Japanese black pine, along barrier islands may be a conservation concern since it will likely encourage American Crow nesting, potentially increasing waterbird predation. Another study conducted in Massachusetts in natural and suburban environments found 100% of nests were in evergreen trees, but 96% of these were in native species (Chamberlain-Auger et al. 1990). Thus, the native versus exotic status of evergreens may not be important to American Crow nesting. However, to avoid the potential risk of predation to waterbird eggs and chicks by American Crows, it might be advisable not to plant evergreens in dense groves.

A greater number of differences were found for species comparisons of habitat characteristics at nest sites and at random sites than were found for nest versus random comparisons within each species. This was a reflection of the different types of general habitats that the two species selected and of the importance of tree type compared to other characteristics measured.

In conclusion, results suggested that at this study area Fish Crows are coastal specialists while American Crows are human habitation specialists, possibly minimizing interspecific interaction and facilitating their coexistence. However, this may be a site specific phenomenon, so it would be valuable to study other locations to determine if the same pattern holds true. Given the territorial behavior of American Crows and Fish Crows (Caccamise et al. 1997, McGowen 2001, Verbeek and Caffrey 2002) and given that Fish Crows nested more frequently in areas where waterbirds nested, Fish Crows likely would be the more serious predator. However, at this location and perhaps at others, the greatest threat to waterbird eggs and chicks may occur at edge locations where natural and humanized sites meet, since both crow species may maintain territories here.

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